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July 6, 2016

Ms. Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street SW
Room TW-A325
Washington, DC 20554

Re: ET Docket No. 13–49, FCC 16–68

Dear Ms. Dortch:

COMMENTS OF DELPHI AUTOMOTIVE

Delphi Automotive is ready to deploy the first of the nation's US DOT production OEM factory installed and aftermarket Smart City DSRC V2x installed devices to meet many US DOT's V2V safety, Vulnerable Road users V2P, and ITS VII Smart City V2I initiatives underway.

Following many years of Dedicated Short Range Communications (DSRC) spectrum coordination, connected vehicle test pilots, standards development, vehicle systems development, rigorous automotive safety field testing, ITS infrastructure development alignment, ITS services development, automated transport channelization, vulnerable road users integration, automotive validations, and unique cybersecure privacy insured transportation security systems development, the DSRC launch schedules are at the final stages to start the commercialization phase and rapid deployment of critically needed 21st transformational Century US Transportation initiatives . These initiatives provide to the US significant new capabilities, ubiquitous secure interoperability, and high performance for evolutionary vehicle to everything transport (V2e) communications to meet crucial US transportation and mobility needs.

Delphi is on target to launch V2V DSRC devices for GM's Model 2017 Cadillac CTS vehicles, scheduled for August 1, 2016, and the MTC Ann Arbor Smart City Pillar 1 later this year.

On behalf of Delphi Automotive, I am pleased to submit the following comments in response to the Public notice ET Docket No. 13-49 FCC 16-68, in which the Commission seeks inputs for the Unlicensed National Information Infrastructure (U-NII) devices in the 5GHz Band requesting public comments of the DSRC Spectrum refresh proposals.

I am a Technical Fellow for RF Infrastructures and Services at Delphi Automotive. I have worked in the transportation communications industry for more than 39 years helping create, launch, and commercialize new, progressively high quality-of-service transport communications systems which became important standard automotive links.

Delphi entities have worked for 80 years to help launch and commercialize virtually every US automotive vehicle communication bands into vehicles and has a long history of mobile communications systems including as examples in: broadcast such as Satellite Radio (both XM and Sirius), FM, AM; peer to peer cellular 1G to 4G such as E-ZPass (electronic tolling), On-Star, Delphi Connect, LTE; peer to peer "IoT" (Internet of Things) such as Wi-Fi; local vehicle area communications such as Bluetooth; and positioning such as GPS, navigation. Additionally, we have developed and produced inertial navigation systems for automotive, aerospace, and spacecraft. Delphi is a leading global supplier of electronics and technologies for automotive, commercial vehicle and other market segments. Operating major technical centers, manufacturing sites and customer support facilities in 30 countries, Delphi is actively working to further advance automotive active safety, autonomous, and connected automated systems.

Delphi appreciates the opportunity to comment on the FCC DSRC refresh public notice, which states: "The Commission now seeks comment on the merits of these two approaches. What are the benefits and drawbacks of each approach?"

As noted above, Delphi is currently deploying the full 75 MHz DSRC spectrum as defined by various governing transportation commissions.

Since Notice of "Proposed Rulemaking in February 2013", Delphi has participated and has been a partner in numerous rule and requirements making commissions including IEEE, SAE, VII, CV and CAV. The USDOT and ITS Smart Cities are adopting the network channelization as shown below.

TABLE 1 Delphi V2x OBU - DSRC Smart City/Transport Channels								
Channel Name	GuardBand DSRC - UNII	Public Safety V2v-CV	Public Safety V2v-CAV/CV	Public Safety V2p	Control Channel	Transport Services	Probe Data	Public Safety Intersections
Channel Number	GB	172	174	176	178	180	182	184
Bandwidth	5Mhz	10Mhz	10Mhz	10Mhz	10Mhz	10Mhz	10Mhz	10Mhz
VAD	•	•			•	•	•	
ASD/RSD	•	•		•	•	•	•	•
CAD	•	•	• CR	•	•	•	•	•
VAD - Vehicle Awareness Device								
ASD - Aftermarket Safety Device								
RSD - Retrofit Safety Device								
CAD - Connected Automated Device								
CR - Coordination Recommendation								

The Delphi on-board unit (OBU) channelization implementation enables US Smart Transport interoperability across the continental US, and amalgamates the SAE, IEEE, OEM, and Smart City CV, VII and CAV standards and initiatives underway.

As seen above in Table 1, the entire 5.9 GHz DSRC Spectrum Band (as currently allocated) has been assigned, coordinated, and developed for exclusive Dedicated Short Range Communications for Transportation use, in order to allow for the upcoming 2016 launches to proceed and for full deployment of the US transportation industry's critical modernization, safety, and automated initiatives.

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This "Transportation DSRC System" has been specifically designed to meet the high speed, high congestion and high positional accuracy for secure coverage for every type of commercial transport system. Many current transformational US initiatives are underway utilizing this Transportation DSRC System that are finalizing deployment plans. As shown above, the entire current 75 MHz DSRC spectrum will be required to fulfill these commercial transportation initiatives. *It is important to note that once these transportation initiatives begin with vehicle launches, the Transportation DSRC System will have to remain in place for the life of these vehicles*

The game changing benefits of this Transportation DSRC System are the following:
1. The potential to save 80% of the >31,000 American lives currently lost on American roads per year.
2. Eliminate significant traffic congestion (e.g. real time re-routing via the V2I capability).
3. Enable user based revenue streams necessary to rebuild and modernize American transportation systems.
4. Significantly reduce US greenhouse gas production, reduce fossil fuel consumption and reduce dependency on foreign sources of petroleum. Examples include Truck platooning, Traffic light optimization, etc.
5. Enable the accelerated deployment of many other new evolutionary transportation services including automated transportation.

The Transportation DSRC System represents an evolutionary artificially Intelligent Transportation System (ITS) In-Vehicle Ad-Hoc Network (InVaNET) system using the WAVE protocol. It has been designed and developed by the transportation industry, and has already undergone many years of rigorous testing for many automotive safety and non-safety uses.

Delphi does not support reallocation and rebanding the bottom 45 MHz to unlicensed Wi-Fi use.

The consolidation of the DSRC use case messaging networks, and full US CV vehicle/VRU population into 30 MHz will not allow for successful full deployment and will severely cripple implementation of the Transportation DSRC System (for V2X). Specifically, the proposed "re-channelization" consolidation of current V2V, V2I, and CAV messaging (30 MHz - 172, 174, 176) channel capacity needs into one 10Mhz channel will severely limit network access and NOT allow for successful exchanges of many critical real time messages. The limiting factors include: 300-1000m range; large numbers of transportation user nodes in congested city area; and automated communications. This endangers large numbers of US citizen's lives and will cripple V2X connected vehicle capabilities needed for the transformation and modernization of the US transportation system.

The elimination of the planned 5 MHz Guard Band (GB) between the UNII Band and the DSRC V2V channel will create additional interference into the high quality safety V2V from the UNII devices in now adjacent frequency. This will increase V2V message losses and while also driving up DSRC hardware interference mitigation costs.

The potential "rechannelization" movement of the low power safety channels (172, 174 and 176) from the current 30 MHz total bandwidth to the "Transport Services" channel 180 having only 10 MHz bandwidth is an unworkable scenario. It is not possible for a single 10 MHz channel to handle the thousands vehicles, vulnerable road user, and other transportation users safety communications simultaneously that would protect

drivers, passengers and pedestrians. This will also drive significant additional interference mitigation costs into both the OBU V2V safety and Traffic Infrastructure (PSI) channel hardware. One lost message at 60 mph introduces 9 feet (vehicle position variability) of critical data error into crash trajectory algorithms. This loss equates to a full lane width (in many urban environments) and close to half a car length.

Additionally, the potential movement of the DSRC (Control) channel 178 to be included in channel 182 (creating a "universal" control channel) will suffer significantly more interference as it would be adjacent to the PSI channel. It will not have the capacity necessary for all the V2I use cases now being readied for deployment. As a final point, both of these scenarios would eliminate the 5 MHz "Guard Band" as shown in Table 1 above. The Guard Band would insulate the Transportation DSRC System from lower band Unlicensed National Information Infrastructure (U-NII) users.

The significantly increased interferences will create significant losses of critical safety messages and information critical for V2V, V2P, and CAV.

Delphi further requests that the FCC not allow the last minute creation of delays from outside (non-Transportation) DSRC parties.

Any delays to implementing the Transportation DSCR System will damage the US Commercial Transportation Industry. The impact would be the stalling of NHTSA's FMVSS #150 Federal register's planned V2V (NPRM) milestones, Car Manufacturers' (OEM's) V2V deployments in process (or planned), many US cities US DOT's Wave 1, Smart City Challenge and Fast Act (planned) V2X initiatives awarded and in process of rollouts. Many US cities not included in the US DOT initiatives above are proceeding with self-funded "Smart City" transportation plans. These will utilize all DSRC spectrum allocated for transportation with large transformational benefits to US citizen safety, transportation efficient modernization and US economics.

Delphi respectfully, yet strongly, voices the need for the FCC and USDOT's Transportation DSRC System band to remain intact for DSRC use only, and launched per current USDOT and US transportation industry full use initiatives to implement the critical US life/crash savings and modernization needs for which it is designed. Delphi urges the FCC to not delay the launch nor diminish or eliminate the DSRC's vital capabilities due to new, last minute co-sharing or re-channelization requirements, which will set back many years of combined transportation industry collaborations, coordination, development, validation, and deployment readiness for the American transportation mobility transformation.

US DOT deployment details with DSRC Channelization plans are the following:

1. Ann Arbor, Michigan: Mobility Transformation Center (MTC) "Living Laboratory 1" VAD OBU's for Ann Arbor Connected Vehicle Test Environment (AACVTE).
   This recently awarded program to Delphi for 1000 VAD units for delivery by year end 2016 has the following DSRC channelization plan, shown in Table 2 below. This channelization plan matches the "Transportation DSRC System" implementation as described above and shown in Table 1.

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Applications	Message	DSRC Channel
Curve Speed Warning	Traveler Information Message (TIM) Geodetic (MAP) and Weather Info	178, 180
Forward Crash Warning	Basic Safety Message (BSM)	172
Electronic Emergency Brake Light	Basic Safety Message (BSM)	172
SPaT	Signal Phase And Timing Message (SPAT)	178,184
Vehicle to Bicycle	Personal Safety Message (PSM)	176
Emergency Vehicle Approach Alert	Emergency Vehicle Alert (EVA)	184
Red Light Violation Warning	Intersection Collision Avoidance (ICA) V2v (BSM), V2P (PSM), I2V (TIM)	172&176&184
Pedestrian in Crosswalk	Personal Safety Message (PSM) and SPaT	176, 178 , 184
Vehicle to Pedestrian safety	Personal Safety Message (PSM) and/or TIM	176, 178
Event Traffic Management	Traveler Information Message (TIM)	180
Eco Approach	Signal Phase And Timing Message (SPAT) and (MAP)	178,184
Transit Signal prioritization	Signal Request Message (SRM), Signal Status Message (SSM)	184
I2V in-vehicle signage	Multiple – TIM	multiple
Fuel station pricing	Traveler Information Message (TIM)	182
SCMS Updates and Messaging	SCMS	180
Slow/stopped vehicle ahead	Roadside Alert (RSA)	172
Truck parking - ranked for trucks	Traveler Information Message (TIM)	180
Work zone/Roadwork notification	Roadside Alert (RSA)	178,180,184
Border wait time	Traveler Information Message (TIM)	180
Road weather	Traveler Information Message (TIM)	180&182
Connected Autonomous vehicles	To be defined (enhanced BSMs)	174 (TBC)

Table 2: MTC DSRC Channelization Plan and Use Cases

2. New York City, New York – "Wave 1" US DOT winner Connected Vehicle (CV) Pilot Program
The following text was provided from NYC in their Request for Expression of Interest (RFEI) For furnishing After Market Safety Devices and Roadside Equipment for V2V and V2I DSRC based safety applications for the New York City Connected Vehicle Pilot Deployment Project June 21, 2016 Version 5:   *"The system will be using 6 of the 7 DSRC channels allocated for CV use. All field devices including both the RSE and the in-vehicle unit ASD will contain 2 radios; one will be dedicated to monitoring or transmitting on channel 172 where it can "hear" the Basic Safety Message (BSM) from all vehicles within range of the radio communications; this is critical for the V2V applications. In addition, it will be able to receive the SPaT message and the MAP message and use this information to support the V2I safety applications. Channel 178 will be used as the control channel to inform approaching vehicles of available services Wave Service Announcement (WSA) and indicating which channel and protocol should be used for the service. The other channels (174,*

176, 180, and 182) will be used to support the OTA software updates, application parameter management, and data collection from the in‑vehicle event logs."

3. Tampa, Florida - "Wave 1" US DOT winner Connected Vehicle (CV) Pilot Program
   Tampa will implement the following use cases (apps) as shown below in Figure 1 in the lower right hand corner. Tampa/THEA has not published their specific channelization plan. The following chart was provided by Tampa on their THEA Connected Vehicle Operations Webinar, published on February 8, 2016, shown below in Figure 1. The entire document is located at:
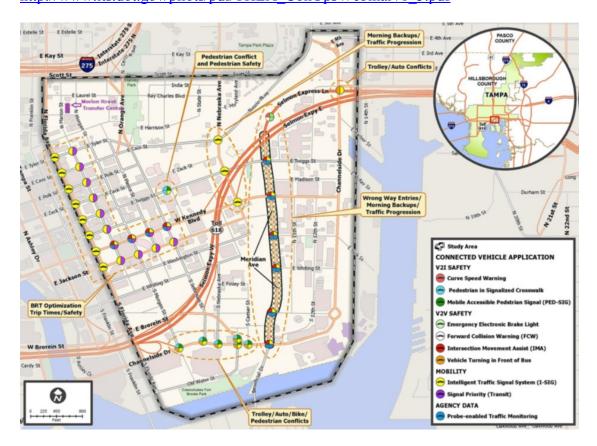   http://www.its.dot.gov/pilots/pdf/THEA_ConOpsWebinarv1_3.pdf

Figure 1: Tampa, Florida Connected Vehicle (CV) Pilot Program information

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US DOT planned use cases requiring the Transportation DSRC System are the following:

1. Ann Arbor, Michigan: Mobility Transformation Center (MTC) "Living Laboratory 1" VAD OBU's for Ann Arbor Connected Vehicle Test Environment (AACVTE). "Living Laboratory 2" are Retrofit (RSD) OBUs. "Living Laboratory 3" devices are Connected Automated (CAD) OBUs   Reference above Table 1 and Table 2 for MTC's OBU channels and use cases deployment plan.

2. New York City, New York – "Wave 1" US DOT winner Connected Vehicle (CV) Pilot Program The following chart was provided by NYC on their NYC Connected Vehicle Operations Webinar, published on April 1, 2016, shown below in Figure 2. The entire document is located at: http://www.its.dot.gov/pilots/pdf/NYC_ConOpsWebinar.pdf

Application Distribution by Fleet

CV Application	Vehicles	Taxi & Limousine	NYC DOT / Sanitation	MTA / NYCTA Buses	Commercial Vehicle	Pedestrian
Qty		7500	500	1500	500	TBD
Pct		75%	5%	15%	5%	TBD
Speed Compliance		Yes	Yes	Yes	Yes	No
Curve Spd Compliance		Yes	Yes	Yes	Yes	No
Speed/work zone Compliance		Yes	Yes	Yes	Yes	No
Frwd Crash Warning		Yes	Yes	Yes	Yes	No
Emer Elec Brake		Yes	Yes	Yes	Yes	No
Blnd Spot Warning		Yes	Yes	Yes	Yes	No
Ln Change Warning		Yes	Yes	Yes	Yes	No
Int Mvmt Assist		Yes	Yes	Yes	Yes	No
Vehicle Turning in Front of Bus		No*	No*	Yes	No*	No
Red Lt Violation Warning		Yes	Yes	Yes	Yes	No
PED in Sig Xwalk		Yes	Yes	Yes	Yes	Yes
PED-SIG		No	No	No	No	Yes
Oversize Veh Compliance		No	Conditional			No
EVAC Info		Yes	Yes	Yes	Yes	No
I-SIGCVDATA		No	No	No	No	No

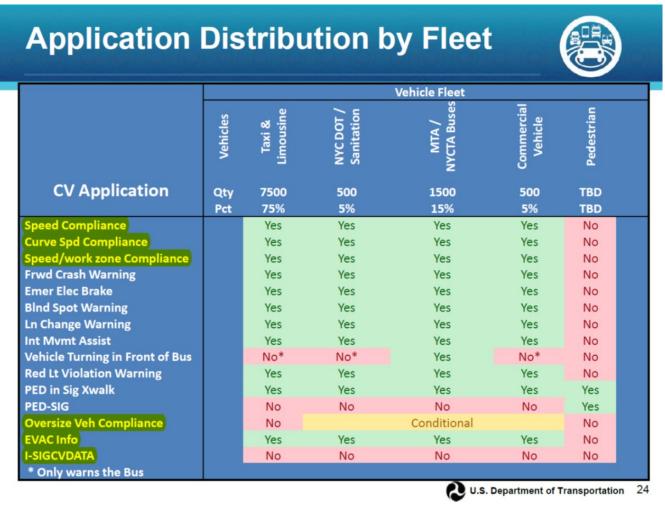* Only warns the Bus

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**Figure 2: New York, New York Connected Vehicle (CV) Pilot Program information**

3. Tampa, Florida - "Wave 1" US DOT winner Connected Vehicle (CV) Pilot Program Tampa will implement the use cases shown above in Figure 1.

4. USDOT and ITS VII Initiatives since February 2013. Many Smart City initiatives are utilizing Connected Vehicle Reference Implementation Architectuer (CVRIA) for project planning and deployment. Delphi OBU deployment channelization and use case device architectures are noted in Table 1.

    a. ACGM Meeting – May 26, 2013

ITS AMERICA

DSRC Safety Applications

Communications between Vehicle and Infrastructure

- Blind Merge Warning
- Curve Speed Warning
- Emergency Vehicle Signal Preemption
- Highway/Rail Collision Warning
- Intersection Collision Warning
- In–Vehicle Amber Alert
- In–Vehicle Signage
- Just–in–Time Repair Notification
- Left Turn Assistant
- Low Bridge Warning
- Low Parking Structure Warning
- Pedestrian Crossing Information at Intersection
- Road Condition Warning
- Safety Recall Notice
- SOS Services
- Stop Sign Movement Assistance
- Stop Sign Violation Warning
- Traffic Signal Violation Warning
- Work Zone Warning

Communications between Vehicles

- Approaching Emergency Vehicle Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- Cooperative Forward Collision Warning
- Cooperative Vehicle–Highway Automation System
- Emergency Electronic Brake Lights
- Highway Merge Assistant
- Lane Change Warning
- Post–Crash Warning
- Pre–Crash Sensing
- Vehicle–Based Road Condition Warning
- Vehicle–to–Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong Way Driver Warning

Figure 3:   ITS America ACGM Meeting May 2013 DSRC Applications

    b. ITS Standard Workshop – SSOM May 5, 2014
        i. The CVRIA (Connnected Vehicle Reference Implementation Architecture) applications.
        ii. Many of these applications are being incorporated in the Smart City initatives, proposals, awards, and deployments now underway.

Connected Vehicle Applications   Please see your handout

V2I Safety
Red Light Violation Warning
Curve Speed Warning
Stop Sign Gap Assist
Spot Weather Impact Warning
Reduced Speed/Work Zone Warning
Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety
Emergency Electronic Brake Lights (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Assist (IMA)
Left Turn Assist (LTA)
Blind Spot/Lane Change Warning (BSW/LCW)
Do Not Pass Warning (DNPW)
Vehicle Turning Right in Front of Bus Warning (Transit)

Road Weather
Motorist Advisories and Warnings (MAW)
Enhanced MDSS
Vehicle Data Translator (VDT)
Weather Response Traffic Information (WxTINFO)

Environment
Eco-Approach and Departure at Signalized Intersections
Eco-Traffic Signal Timing
Eco-Traffic Signal Priority
Connected Eco-Driving
Wireless Inductive/Resonance Charging
Eco-Lanes Management
Eco-Speed Harmonization
Eco-Cooperative Adaptive Cruise Control
Eco-Traveler Information
Eco-Ramp Metering
Low Emissions Zone Management
AFV Charging / Fueling Information
Eco-Smart Parking
Dynamic Eco-Routing (light vehicle, transit, freight)
Eco-ICM Decision Support System

Agency Data
Probe-based Pavement Maintenance
Probe-enabled Traffic Monitoring
Vehicle Classification-based Traffic Studies
CV-enabled Turning Movement & Intersection Analysis
CV-enabled Origin-Destination Studies

Mobility
Advanced Traveler Information System
Intelligent Traffic Signal System (I-SIG)
Signal Priority (transit, freight)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Emergency Vehicle Preemption (PREEMPT)
Dynamic Speed Harmonization (SPD-HARM)
Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)
Connection Protection (T-CONNECT)
Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)
Freight-Specific Dynamic Travel Planning and Performance
Drayage Optimization

Smart Roadside
Wireless Inspection
Smart Truck Parking

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Figure 4:   ITS Standards Workshop SSOM May 2014   CVRIA Applications

The Transportation industry is now beginning the integration and deployment of a much larger number of significant applications since February 2013. As we include the pedestrian safety, CVRIA, and automated applications, the spectrum plan and it's available capacity will be critical for full deployment and successful implementation of the vital new transformational value that DSRC brings for the modernization of the US Transportation network. .

Once fully deployed, the Transportation DSRC system will be a self-intelligent network that is secure and safe, having the lowest cost to US consumers, with an efficient spectrum use communications systems available, specifically for the broad transformational US Transportation system modernization needs.

The transportation industry requirements of crash trajectory messaging in all transportation areas of the around the vehicle, having large simultaneous area of relevance ad-hoc network connections, high quality of service, cybersecure, and steps in mobility position accuracy capabilities aren't met with the alternates.

Please feel free to contact the following individuals for additional information.

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